

DOCUMENT RESUME

ED 394 554

JC 960 289

AUTHOR Berry, James; Ellington, Deborah
TITLE Chasing Your Tail: Resource Management in the Technology-Based Classroom.
PUB DATE Feb 96
NOTE 7p.; In: The Olympics of Leadership: Overcoming Obstacles, Balancing Skills, Taking Risks. Proceedings of the Annual International Conference of the National Community College Chair Academy (5th, Phoenix, AZ, February 14-17, 1996); see JC 960 276.
PUB TYPE Reports - Descriptive (141) -- Speeches/Conference Papers (150)
EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Community Colleges; Computer Assisted Instruction; *Computer Graphics; *Computer Storage Devices; *Multimedia Instruction; *Multimedia Materials; Two Year Colleges

ABSTRACT

Even though the increasing amount of multimedia material available for technology-assisted classrooms can make presentations more attractive and aesthetically pleasing, instructors and administrators should be aware of the increased demand on technology resources that the new graphics and animation programs create. Use of these materials invariably increases the memory requirements of hardware, while attempts to create multimedia materials can put strains on a system's storage and transfer capacities. To more effectively use technology assisted programs, individuals should have an understanding of the nature of graphics files and elements which effect the size of files. Graphics can be either bitmaps, a matrix of dots drawn on the screen and used for photo-realistic images, or vector-drawn, used for geometric shapes. In terms of memory for creating and storing graphics, the size and resolution (i.e., number of pixels per linear inch) should be taken into consideration, as well as the bit depth of the color palette, which ranges from 1-bit for black and white or any two colors to 24-bit, providing more than 16 million colors and used for photo-realistic images. The most common image formats include the Macintosh graphics format (PICT); the Joint Photographic Experts Group (JPEG) format, allowing for considerable compression; and Graphics Interchange format (GIF). (BCY)

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CHASING YOUR TAIL:
**RESOURCE MANAGEMENT IN THE TECHNOLOGY
 BASED CLASSROOM**

By

James Berry
 Director, Technology
 and
Deborah Ellington
 Associate Dean, Fine Arts
 North Harris College
 Houston, TX

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Paper Presented at the
 Fifth Annual International Conference for
 Community & Technical College Chairs, Deans and Other Organizational Leaders
 February 14 - 17, 1996
 Phoenix/Mesa, Arizona

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Biography

Deborah N. Ellington went to Albion College in Michigan where she received a BA in Art Education. After graduating from Albion she taught in the government's VISTA program in rural Tennessee before moving back to Michigan to teach in a small country school. She returned to the University of Michigan to complete an MA in painting and in 1974 moved to Houston, Texas to chair the Art Department of the newly established North Harris College. In 1982 she received an MFA in ceramics from Sam Houston State University. Deborah is now Associate Dean of Visual & Performing Arts at North Harris College and is also a showing, professional artist.

Jim Berry, Director of Technology for North Harris College, is involved with the pragmatic details of moving and storing the extensive files generated through multimedia development and use. As a multimedia developer since the late 1980s, he is further interested in the characteristics of multimedia component files from the standpoint of quality and size. His work with North Harris faculty and students has developed a variety of procedures and the use of a number of storage devices to assist the users with the ever-growing challenge of electronic file storage and maintenance.

Chasing Your Tail: Resource Management in the Technology Based Classroom

Deborah Ellington & Jim Berry
North Harris College, Houston

The tidal wave of multimedia material washing over the instructional bulkheads of the technology-assisted classroom this past year has added new dimensions to the technology scene. To be sure, the dimensions of engagement, attractiveness, and aesthetics are all enhanced by the influx of beautiful graphics and animations that accompany the new multimedia material. Of importance to the instructor and administrator involved with the technology classroom, though, are the less exciting but more demanding dimensions of increased demand on technology resources. Use of the Word Wide Web and CD ROM based material immediately impact the memory requirements of the hardware, and any attempt at creating these multimedia materials immediately results in significant implications on the data storage and transfer portions of the system. This presentation seeks to equip those involved with technology assisted programs the information to make better decisions regarding creation and use of graphical files and solutions to data storage requirements in the multimedia classroom.

The Nature of Graphics Files (A Primer)

Images displayed on computer monitors are generated either as *bitmaps* or *vector-drawn* graphics refreshed about every 1/60 of a second (or faster) depending on the monitor's scan rate. A *bitmap* is a simple information matrix describing the individual dots that are the smallest elements of resolution on a computer screen or other display or printing device. Bitmaps are used for photo-realistic images and for complex drawings requiring fine detail. *Vector-drawn* objects are used for lines, boxes, circles, polygons, and other graphic shapes that can be mathematically expressed in angles, coordinates, and distances. A drawn object can be filled with color and patterns and can be selected as a single object.

The appearance of both types of images depends on the display resolution and capability of your computer's graphics hardware and monitor. Both are stored in various file formats and can be translated from one application to another or across platforms (e.g. Macintosh > PC). Typically, image files are compressed to save memory and disk space.

Still images used within multimedia projects may be either created (e.g. software) or acquired (e.g. captured, scanned, digitized). In order to make intelligent choices about the hardware, software, and skills needed for image acquisition, storage, and retrieval careful consideration must be given to what the images will ultimately be used for. Output, in other words, determines input.

Having this information in advance assists in determining resolution, color, and file format for saving the image. Disregarding these factors wastes valuable file space on unnecessarily large files or results in the need to jettison excess color information at a later time.

The Trade-Off Between Resolution and Size

Image size refers to the physical dimensions of an image. *Resolution* is the number of pixels per linear inch. Use the smallest image size and lowest resolution consistent with obtaining the highest quality and results available on the target hardware and software platforms to be utilized. Remember, these may differ significantly from the platform on which the presentation is being developed. When creating an image for a screen presentation or display, using higher resolution images than necessary hogs valuable system resources (RAM or hard disk storage) and slows retrieval and display.

Color palette

Common color palettes are 1,4,8,16, and 24 bits deep. Bit depth corresponds with the number of colors available.

Color Depth	Colors Available
1-Bit	Black and White (or any 2 colors)
4-Bit	16 colors
8-bit	256 colors (good enough for color images)
16-bit	Thousands of colors (excellent for color images)
24 bit	More than 16 million colors (Photo-realistic)

The color range offered by 24-bit systems covers what the human eye can sense; however, only 307,200 actual pixels are available at any one time on typical Macintosh and PC display monitors (640x480). These are more than sufficient for excellent gradients and photo-realism.

Currently, most multimedia is presented on color monitors that display a matrix of 640 pixels across and 480 pixels down (640x480) up to 1,024x768 usually at 72 pixels or dpi (dots per inch). 8 bit (256 colors) is the defacto standard, although 16 bit (thousands) & 24 bit (millions) of color systems are becoming more commonly available. Despite this trend, multimedia is generally written for the lowest common denominator which remains 8 bits.

A Side-by-Side Comparison

The presentation will demonstrate side-by-side comparisons of images saved in various formats and resolutions. Some of the common image formats include:

Native Formats

Most high end image creation (I.e. Paint or draw) editing applications (Adobe Photoshop, Fractal Design Painter) allow you to save images in a proprietary file format that is recognized only by that application. Proprietary file formats offer advantages of smaller file size and the ability to save complex types of information (e.g. layers, selection masks, vector paths, and channels). Their disadvantage is that they may not be recognized or easily usable outside the application.

Programs that save graphics files in a proprietary format generally offer options to save visual images in one or more industry standard formats for translation and exchange with other software. Image translation and exchange application software is also available to open, translate, and save visual images from one format to another (e.g. Debabelizer, etc.) Common graphic file formats are presented in Table 1 and discussed below.

Industry Standard Formats

PICT (Macintosh Picture) - Is the Macintosh system software's native graphics format based on the QuickDraw display language that the system software uses to convey images on the monitor. It is one of the few graphic file formats that handles both bitmapped and object oriented images equally well and supports any bit depth, size, or resolution; including 32-bit images; so that you can save a fourth masking channel when working in the RGB mode. With QuickTime installed on the Macintosh, you can subject PICT images to JPEG compression. It is difficult, however, for most PC programs and machines to handle PICT files with JPEG compression.

JPEG (Joint Photographic Experts Group) - Is the most effective and essential compression format available and is likely to remain the compression standard for years to come. It is a 'lossy' compression scheme meaning that it sacrifices image quality in return for conserving storage space. The user, however, can control how much data is lost during compression by selecting image quality during the save process.

JPEG is best used when compressing continuous-tone images (where distinction between neighboring pixels is slight). Any image that includes gradual color transitions (e.g. photographs) qualifies for JPEG compression. High contrast images (e.g. Screenshots, line drawings, etc.) are not good candidates for JPEG compression and are better served by a lossless compression scheme such as TIFF.

The JPEG format is more desirable than PICT when transfer to the PC platform is contemplated. More PC applications recognize JPEG, and is difficult to find a Windows program capable of handling PICT files with QuickTime JPEG compression.

TIFF (Tag Image File Format) - Developed by Aldus back in the early days of the Macintosh specifically for page layout applications. It is the most widely supported bitmapped format across both Macintosh and PC platforms and all image editing, painting, and page-composition packages support the latest version 6.0. Unlike PICT, it can't handle vector drawn graphics nor does it support JPEG compression.

EPS (.eps, .epsf) - Encapsulated PostScript file format (abbreviated as .eps on the PC and as .epsf on the Macintosh) is another cross platform standard. Originally intended for vector drawn graphics but extended to include bitmapped images. Unlike vector EPS images; however, bitmapped EPS images can not be infinitely enlarged without degradation.

GIF (.gif) - Graphics Interchange Format was developed by CompuServe as a means of compressing 8-bit images so users could transfer photographic images via modem. Many on-line image files are either GIF or JPEG files. GIF uses LZW compression but can't handle more than 256 colors.

BMP (.bmp) - The Windows bitmap format was developed for compatibility and is supported by a variety of OS/2 applications (albeit their own version of .bmp) as well. BMP files are accepted by many multimedia authoring, presentation, and digital video-editing programs on both the PC and Macintosh platforms. You can save black and white, grayscale, color index and RGB color (but not duotones or CMYK color) images as BMP files.

TARGA (.tga) - Developed by TrueVision for use in it's high end paint and video authoring application and is still commonly in use on the PC platform. TARGA files can save grayscale, and RGB images at color depths of 16,24, and 32 bit. A 32 bit TARGA file can contain alpha channel information.

Those Bulging Closets

Data storage devices change in type and capacity almost weekly. Current technologies will be reviewed at the Conference with representative costs and relative advantages. At the time of this writing (12/95) some of the more common storage options include internal hard drives in excess of 1GB, SyQuest cartridge technology, tape technologies, Bernoulli drives, ZIP and JAZ removable cartridge drives, and optical drives.

Presentation Handouts:

Copy of presentation
Comparison of graphics file types
Relative size comparison of common multimedia files
Current data storage options matrix